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Stable, smaller ice cap in East Greenland shows presence of Eemian ice supported by radar, ice core data and model simulation

Content

The Renland ice cap, East Greenland, is located at a high-elevation plateau in the Eastern mountains of Greenland, with an elevation of 2340 m, an ice thickness of almost 600 m, and a few steep outlet glaciers flowing in valleys that reach all the way to sea level in the surrounding fjords. The Renland ice cap is believed to be strongly constrained by the topography.

It is thus an ideal site to search for old ice and to obtain an ice core record with a pure climate signal undisturbed by elevation changes. In 2015, the Renland Ice Cap, the REland ice CAP project (RECAP) drilled an ice core to the bottom of the Renland ice cap. Here, we present the results of a ground-penetrating radar (GPR) survey to select the location of an ice core drilling campaign, which occurred in 2015 prior to the ice core drilling, combined with the ice core timescale to search for ice from the previous interglacial, the Eemian, 130.000 – 115.000 years before present. The radar survey used a GPR radar developed for use on the Renland Ice Cap. This instrument is able to detect individual reflectors near the bedrock, which airborne surveys are largely unable to resolve. The radar stratigraphy is combined with the ice core timescale to trace the transitions of glacial/interglacial ice. An ice flow model tuned to the ice core timescale, suggest that the bottom ice may rest in a bedrock depression with limited flow. Our results show that a layer of Eemian ice is present at the bottom of the Renland Ice Cap and can be traced over several km. We have furthermore, run an ice flow model, PISM, over the last glacial/interglacial cycle, forced by proxy derived temperature and accumulation rate histories from ice core records. The evolution of the surface elevation from the RECAP drill site suggests that the Renland Ice Cap has been very stable through the last glacial cycle with limited response to climate changes.

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